

A New Ophidiid Species, *Hoplobrotula badia*, from Sagami Bay, Central Japan

Yoshihiko Machida

Department of Biology, Faculty of Science, Kochi University, 2-5-1 Akebono, Kochi 780, Japan

Abstract A new ophidiid fish, *Hoplobrotula badia*, is described from a single specimen from the Pacific Ocean off central Japan. This species is distinguished from its congeners by the following combination of characters: snout spine extremely short and blunt, no sensory pore just above anterior nostril, dorsal fin rays 94, anal fin origin below 17th dorsal fin ray, abdominal vertebrae 13, pelvic fin extending well beyond posterior margin of head, and color of head and body uniformly deep brown.

The ophidiid fish genus *Hoplobrotula* contains two nominal species: *H. armata* (Temminck et Schlegel, 1846) from Japan, and *H. gnathopus* Regan, 1921 from the Indian Ocean (Cohen and Nielsen, 1978).

An example of an undescribed species of *Hoplobrotula* was found in the fish collection of the Department of Zoology, University Museum, University of Tokyo (ZUMT). It is here described as *Hoplobrotula badia* sp. nov.

Counting and measuring methods follow Okamura and Kitajima (1984), except for the following: gill raker counts on the first arch follow Cohen and Nielsen (1978). Vertebrae and median fin rays were counted from radiographs.

Institution abbreviations follow Leviton et al. (1985).

Hoplobrotula badia sp. nov.

(New Japanese name: Kuro-yoroi-itachiuo)
(Figs. 1-3)

Holotype. ZUMT 57621, 558 mm standard length (SL), female, Manazuru Fish Market facing Sagami Bay, Odawara City, Kanagawa Prefecture, central Japan, probably caught by angling, depth unknown, collected by M. Aizawa, 18 Nov., 1985.

Comparative material. *Hoplobrotula armata* (32 specimens): BSKU 33816, 278 mm SL, 29°19'N, 127°18'E, East China Sea, otter trawl, 260 m, 13 Oct., 1979; BSKU 33674-33675, 2 specimens, 291-478 mm SL, 30°04'N, 107°40'E, East China Sea, otter trawl, 220-245 m, 27 Oct., 1979; BSKU 34417, 398 mm SL, 28°33'N, 126°31'E, East China Sea, otter trawl, 325-330 m, 16 Dec., 1979; BSKU 38385, 160 mm SL, Mimase Fish Market facing Tosa Bay, Kochi City, Kochi Prefecture, southern Japan, bottom trawl, 18 Dec., 1982; BSKU 38624-38635, 12 specimens, 153-183

mm SL, Mimase Fish Market, bottom trawl, 5 Mar., 1983; BSKU 46728-46729, 2 specimens, 299-315 mm SL, Mimase Fish Market, bottom trawl, 10 Feb., 1988; BSKU 46730-46736, 7 specimens, 141-290 mm SL, Mimase Fish Market, bottom trawl, 15 Oct., 1988; BSKU 46737-46739, 3 specimens, 145-219 mm SL, Mimase Fish Market, bottom trawl, 5 Nov., 1987; BSKU 46740, 241 mm SL, Mimase Fish Market, bottom trawl, 15 Dec., 1987; BSKU 46741-46742, 2 specimens, 167-192 mm SL, Mimase Fish Market, bottom trawl, 31 Mar., 1988.

Hoplobrotula gnathopus (4 specimens): BMNH 1921.3.1: 22 (radiographs only), holotype, ca. 280 mm SL, off Natal, South Africa, trawl, ca. 234 m; RUSI 12507, 225 mm SL, 29°45'S, 31°26'E, 344 m, 11 Aug., 1920; USNM 216447, 2 specimens, 328-332 mm SL, 25°32'S, 33°24'E, R.V. Anton Bruun, trawl, 450-455 m, 28 Sep., 1964.

Diagnosis. This species is distinguished from its congeners by the following combination of characters: snout spine extremely short and blunt, no sensory pore just above anterior nostril, dorsal fin rays 94, anal fin origin below 17th dorsal fin ray, 13 abdominal vertebrae, pelvic fin extending well beyond posterior margin of head, and color of head and body uniformly deep brown.

Description. Counts: Dorsal fin rays 94; anal fin rays 79; caudal fin rays 4+5=9; pectoral fin rays 22; pelvic fin rays 2; scale rows above lateral line 10; scale rows below lateral line 27; branchiostegal rays 8; developed rakers on 1st gill arch 1+4=5; dorsal fin origin above 6th vertebra; anal fin origin below 14th vertebra and/or 17th dorsal fin ray; vertebrae 13+40=53; pyloric caeca 13.

Proportional measurements in % of SL given first, followed by absolute measurements in mm in parentheses: Head length (HL) 23.4 (130.7); predorsal length 29.8 (166.2); preanal length 44.1 (246.0);

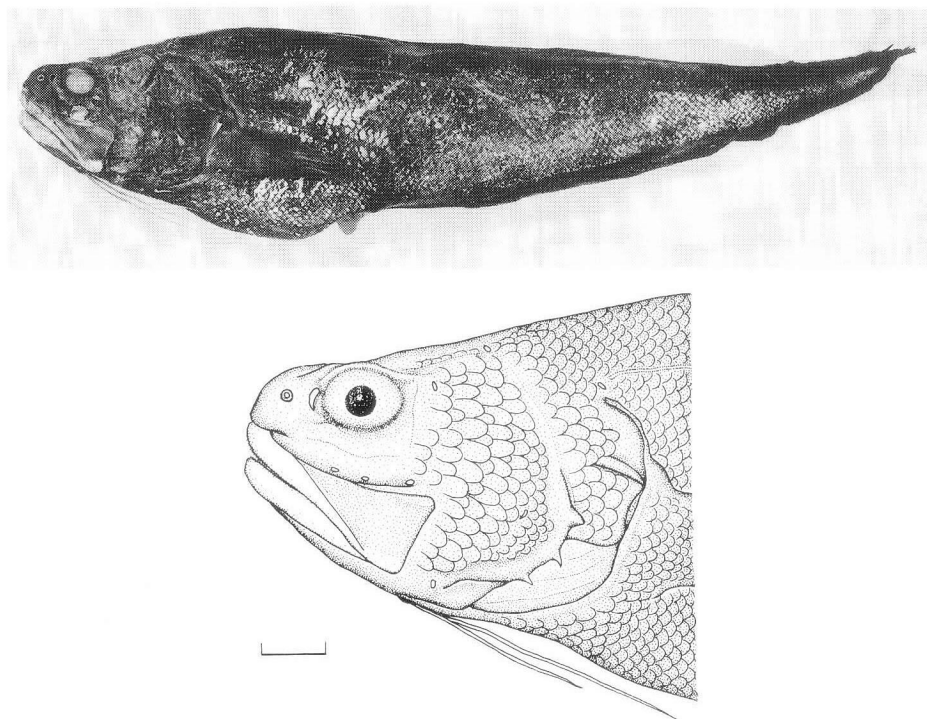


Fig. 1. *Hoplobrotula badia* sp. nov., holotype, ZUMT 57621, 558 mm SL, from Sagami Bay, Pacific off central Japan. Scale bar indicates 2 cm.

maximum body depth 23.8 (133.0); body depth at anus 19.2 (107.0); body width 11.7 (65.3). Proportional measurements in % of HL given first, followed by absolute measurements in mm in parentheses: Snout length 21.0 (27.5); eye diameter 19.9 (26.0); interorbital width 21.5 (28.2); upper jaw length 55.1 (72.1); lower jaw length 59.3 (77.6); pectoral fin length 71.8 (93.3); pelvic fin length 78.5 (102.6).

Head and body compressed; head slightly longer than half of preanal length (Fig. 1). Snout blunt, not protruding beyond upper jaw; snout spine extremely short, blunt (Fig. 2). Upper jaw extending about one-half eye diameter beyond posterior margin of eye. Posterior end of maxillary expanded, slightly longer than eye diameter. Lower jaw included in upper jaw. Eye oval, shorter than snout length. Anterior nostril small, circular, with a thin, fleshy raised rim. No sensory pore just above anterior nostril. Posterior nostril larger than anterior nostril, just in front of eye. Interorbital space wide, weakly concave; nape rather flat. Opercular spine strong, directed somewhat downward, reaching posterior margin of opercular membrane. Three strong,

emergent spines at angle of preopercle. Teeth villiform, in narrow bands in jaws, and on prevomer and palatines. Prevomerine tooth band widely U-shaped. Tongue broad, pointed. Basibranchial with both a median and a pair of tooth patches. Gill rakers on 1st arch short, longest raker at angle, shorter than one-half eye diameter (Fig. 3). Pseudobranchial filaments about 13, much reduced.

Dorsal fin origin slightly posterior to pectoral axil. Dorsal and anal fins continuous with caudal fin. Pectoral fin long, acute, scarcely reaching anus. Pelvic fins with 2 rays in each, fins closely adjacent, inserted below posterior margin of eye; inner fin ray longest, extending well beyond posterior margin of head.

Scales absent from top of head, side of head before posterior margin of eye, maxillary, underside of head and opercular membrane. Body completely covered with imbricate cycloid scales. Dorsal and anal fins scaleless. Lateral line single, running from slightly above upper angle of gill opening to near caudal fin base.

Pyloric caeca short, finger-like. Swim bladder large, thick walled.

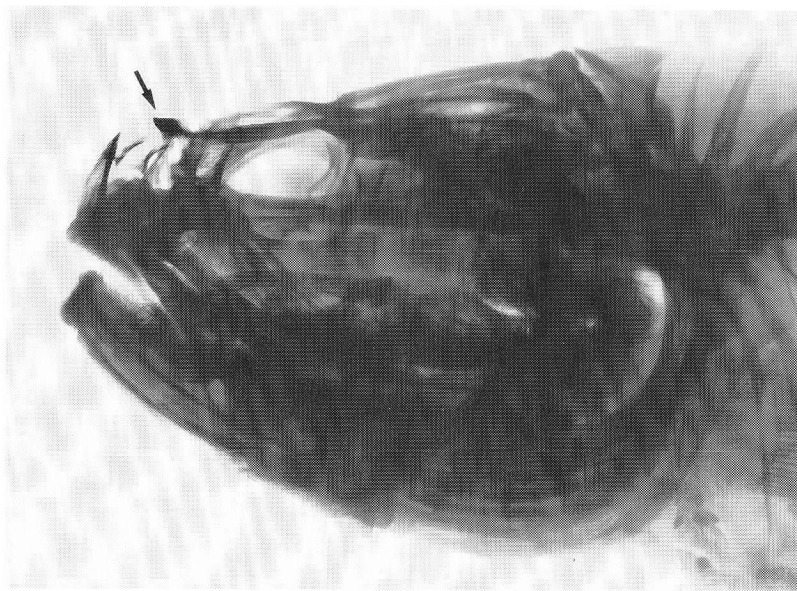


Fig. 2. Radiograph of head of the holotype of *Hoplobrotula badia* sp. nov. Arrow indicates snout spine.

Coloration. Head and body uniformly deep brown; median fins much darker. Flethy raised rim of anterior nostril, lips and pelvic fin rays whitish. Mouth cavity blue-black. Peritoneum jet-black; intestine creamy yellow.

Distribution. Known only from Sagami Bay, Pacific Ocean off central Japan.

Etymology. Derived from the Latin word "badius" meaning "deep brown," in reference to the coloration of the head and body.

Remarks. *H. badia* is easily identified as a member of *Hoplobrotula*: pelvic fin with 2 rays, inserted beneath the eye; 3 strong spines at the angle of the preopercle; 5 developed gill rakers on the first arch and basibranchial with both a median and a pair of tooth patches (Cohen and Nielsen, 1978).

Tables 1 and 2 compare *H. badia* with two previously described species of *Hoplobrotula*. *H. armata* was originally reported by Temminck and Schlegel (1846) with a brief description. This species is commonly found in the central and southern waters around Japan, the East China Sea and the Yellow Sea (Yamada, 1986). Although descriptions of the species were given by Jordan and Fowler (1902) and Machida in Okamura and Kitajima (1984), detailed meristic variation based on more than 30 specimens and data on relative growth of the pectoral and pelvic fins are given here for the first time. *H. gnathopus* was described by Regan (1921) from a

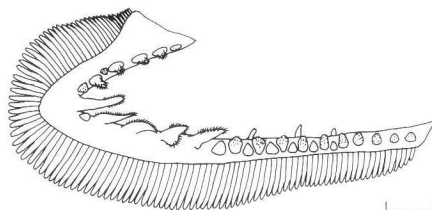


Fig. 3. Right first gill arch of the holotype of *Hoplobrotula badia* sp. nov. Scale bar indicates 1 cm.

single specimen from Natal, South Africa. The occurrence of this species in the Indian Ocean was confirmed by Barnard (1927). Vertebral counts, the presence of a sensory pore just above the anterior nostril, and the absence of a nasal spine in this species are mentioned here for the first time.

Radiographs of the head of *H. armata* and *H. gnathopus* are shown in Fig. 4. It is evident that a long, strong, sharp nasal spine is seen only in *H. armata*, and that *H. gnathopus* is devoid of this spine. *H. badia* is clearly separable from the two previously described species in this character. In addition, *H. badia* differs from *H. armata* in the following characters: no sensory pore just above the anterior nostril (present in the latter), 94 dorsal fin rays (85–90), pelvic fin extending well beyond head (not reaching posterior margin of head), and head and body uni-

formly deep brown (pale brown, becoming lighter on belly). *H. badia* also differs from *H. gnathopus* in the counts of dorsal fin rays (99–103 in the latter) and abdominal vertebrae (13 vs. 15). Shcherbachev (1980) reported a specimen of *H. gnathopus* with about 115 dorsal fin rays from the Indian Ocean. The number of dorsal fin rays in *H. gnathopus* specimens examined in the present study is 100 or 101, and agrees well with Nielsen and Cohen's (1986) counts (99–103). It seems that the Soviet specimen was not *H. gnathopus*, because the intraspecific variation of dorsal fin ray counts in *H. armata* is rather small (six rays in 32 specimens), and Shchervachev's specimen had four preopercular spines. The differences between *H. badia* and *H. gnathopus* are also seen in the position of the anal fin origin (below the base of the 17th dorsal fin ray vs. 21st–23rd dorsal fin ray), and coloration of the head and body (uniformly pale brown in the latter). *H. gnathopus* has a distinct sensory pore just above the anterior nostril,

and an inner pelvic fin ray which does not reach the posterior margin of the head, as in *H. armata*.

It should be noted that the pectoral fin length of *H. armata* exhibits negative allometric growth in relation to head length ($\log y = 0.803 \log x + 0.199$, $r = 0.989$) (Fig. 5). A similar tendency can be seen in *H. gnathopus*. On the other hand, the pelvic fin length of *H. armata* exhibits positive allometric growth in relation to head length ($\log y = 1.139 \log x - 0.483$, $r = 0.986$) (Fig. 6). Relative growth of the pelvic fin in *H. gnathopus* resembles that in *H. armata*. The pectoral fin of *H. badia* seems to be longer than those of *H. armata* and *H. gnathopus*. At present, I think that the length of the pelvic fin is one of the species diagnostic characters of *H. badia*, because that of the holotype (79% of HL) apparently differs from those of *H. armata* (48–64% of HL) and *H. gnathopus* (55–58% of HL).

Table 1. Comparison of nominal species of *Hoplobrotula*.

Source	<i>H. badia</i> sp. nov.	<i>H. gnathopus</i>	<i>H. armata</i>
	Present material	Nielsen and Cohen (1978) Present material	Yamada (1986) Present material
Snout spine	short, blunt	absent	long, sharp, strong
Sensory pore above anterior nostril	absent	present	present
Dorsal fin rays	94	99–103	85–90 (mode: 88)
Anal fin rays	79	78–82	71–77 (76)
Caudal fin rays	9	9	9 or 11 (9)
Pectoral fin rays	22	22–23	19–23 (22)
Developed rakers on 1st gill arch	1+4=5	1+4–5=5–6	1+4–5=5–6 (5)
Vertebrae	13+40=53	15+43=58	13+40–43=53–56 (54)
Anal fin origin below dorsal fin ray no.	17th	21st–23rd	13rd–17th (15th)
Pectoral fin (% of HL)	72	58–66	58–86
Pelvic fin (% of HL)	79	55–58	48–64
Tip of pelvic fin	behind head	before head margin	before head margin
Color of head and body	uniformly deep brown	uniformly pale brown	pale brown, lighter on belly

Table 2. Frequency distribution for dorsal and anal fin rays of *Hoplobrotula* specimens examined in the present study.

	Dorsal fin rays																	Anal fin rays												
	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	72	73	74	75	76	77	78	79	80	81	82		
<i>H. badia</i> sp. nov.										1															1					
<i>H. gnathopus</i>																2	2										1	2	1	
<i>H. armata</i>		3	2	5	11		4	7											2	1	4	10	13	2						

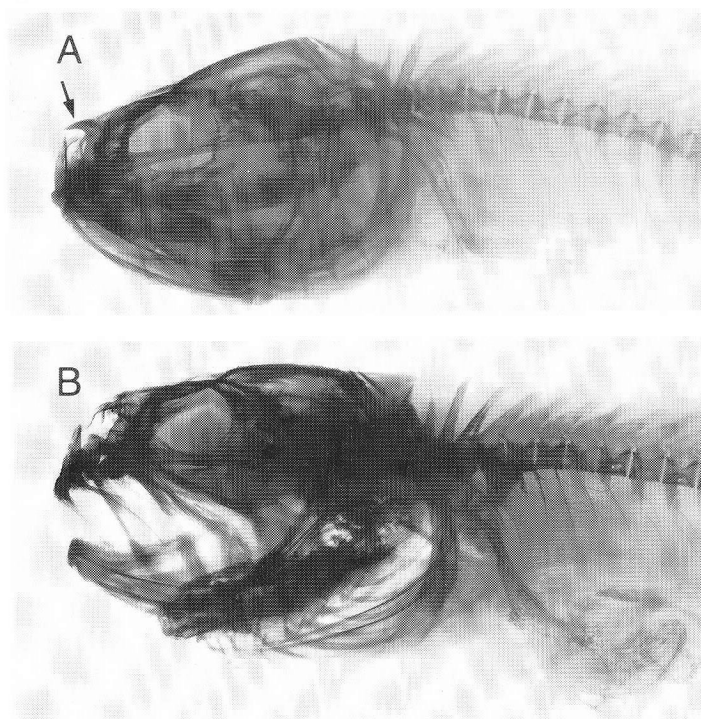


Fig. 4. Radiographs of head. A, *Hoplobrotula armata*, BSKU 46728, 315 mm SL; B, *H. gnathopus*, USNM 216447, 332 mm SL. Arrow indicates snout spine.

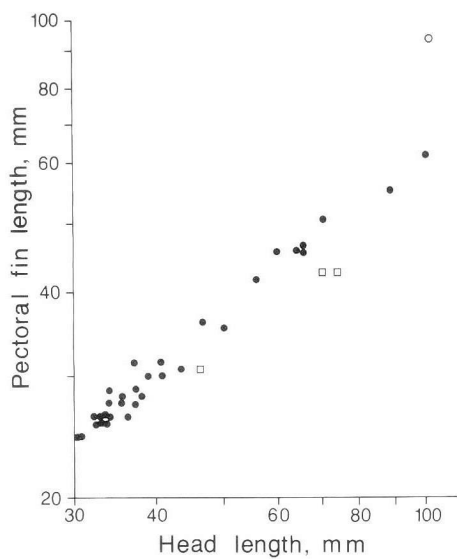


Fig. 5. Relationship between pectoral fin length and head length in the three species of *Hoplobrotula*. Open circle, *H. badia* sp. nov.; closed circles, *H. armata*; open squares, *H. gnathopus*.

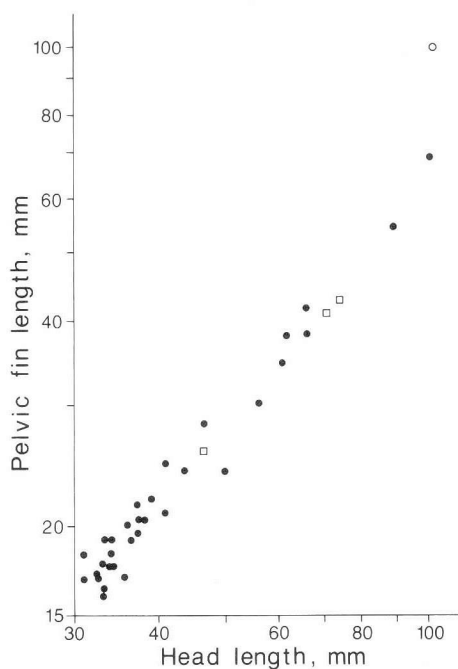


Fig. 6. Relationship between pelvic fin length and head length in the three species of *Hoplobrotula*. Symbols are as in Fig. 5.

Key to the species of *Hoplobrotula*

- A₁ Snout spine absent; dorsal fin rays 99–103; abdominal vertebrae 15
..... *H. gnathopus* Regan, 1921
- A₂ Snout spine present; dorsal fin rays 94 or less; abdominal vertebrae 13 B
- B₁ Snout spine long, sharp, strong; sensory pore just above anterior nostril present; dorsal fin rays 85–90; pelvic fin not extending beyond head; head and body pale brown, becoming lighter on belly. *H. armata* (Temminck et Schlegel, 1846)
- B₂ Snout spine extremely short, blunt; no sensory pore just above anterior nostril; dorsal fin rays 94; pelvic fin extending well beyond head; head and body uniformly deep brown. *H. badia* sp. nov.

Acknowledgments

I thank Mr. M. Aizawa and Dr. Y. Tominaga (ZUMT) for their permission to examine the holotype of *H. badia*. My thanks are also extended to Drs. P. C. Heemstra (RUSI) and S. L. Jewett (USNM) for loaning specimens, and Mr. G. Howes (BMNH) for supplying radiographs of the holotype of *H. gnathopus*.

Literature cited

- Barnard, K. H. 1927. A monograph of the marine fishes of South Africa. Part II. Ann. S. Afr. Mus., 21: 419–1065.
- Cohen, D. M. and J. G. Nielsen. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. NOAA Tech. Rep. NMFS Circ., (417): 1–72.
- Jordan, D. S. and H. W. Fowler. 1902. A review of the ophidioid fishes of Japan. Proc. U.S. Natn. Mus., 25:

- 743–766.
- Leviton, A. E., R. H. Gibbs, Jr., E. Heal and C. E. Dawson. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collection in herpetology and ichthyology. Copeia, 1985(3): 802–832.
- Nielsen, J. G. and D. M. Cohen. 1986. Family No. 96: Ophidiidae. Pages 345–350 in Smith, M. M. and P. C. Heemstra, eds. Smiths' sea fishes. Springer-Verlag, Berlin, xx+1047 pp., 144 pls.
- Okamura, O. and T. Kitajima, eds. 1984. Fishes of the Okinawa Trough and the adjacent waters. I. Japan Fisheries Resource Conservation Assoc., Tokyo, 414 pp.
- Regan, C. T. 1921. New fishes from deep water off the coast of Natal. Ann. Mag. Nat. Hist., Ser. 9, 7: 412–420.
- Shcherbachev, Yu. N. 1980. Preliminary review of deep-sea ophidiids (Ophidiidae, Ophidiiformes) of the Indian Ocean. Trud. Inst. Okeanol., 110: 105–176. (In Russian with English summary.)
- Temminck, C. J. and H. Schlegel. 1846. Pisces. Pages 173–269 in P. F. von Siebold, ed. Fauna Japonica. Part 5. Leiden.
- Yamada, U. 1986. *Hoplobrotula armata* (Temminck et Schlegel). Page 102 in O. Okamura, ed. Fishes of the East China Sea and the Yellow Sea. Seikai Regional Fisheries Research Lab., Nagasaki, xxvi+501 pp. (In Japanese.)

(Received October 11, 1989; accepted July 11, 1990)

相模湾産のヨロイタチウオ属の1新種

町田吉彦

相模湾産の1個体(雌, 標準体長 558 mm)に基づき, アシロ科ヨロイタチウオ属の新種 *Hoplobrotula badia* クロヨロイタチウオを記載した。本種は吻棘が極めて短く, 円鈍であること, 前鼻孔の直上に感覚孔がないこと, 背鰭鰭条数が 94 本であること, 臀鰭始部は第 17 背鰭鰭条の下方に位置すること, 腹椎骨数が 13 個であること, 腹鰭は頭部後端を大きく越えること, 頭と体は一様に黒褐色であることで既知の 2 種と区別できる。本属の 3 種の検索表を提示した。

(780 高知市曙町 2-5-1 高知大学理学部生物学教室)